In the Claims

Cancel claims 66-101.

New Claims

Sub F2 E6

102. A method for forming an insulative layer having a relatively low dielectric constant comprising:

loading a substrate including at least partially formed integrated circuitry thereon into a reaction chamber for a chemical vapor deposition apparatus;

with the substrate in the reaction chamber, chemically vapor depositing a first layer, having a first dielectric constant, over the substrate and on the at least partially formed integrated circuitry by introducing into the reaction chamber a gaseous material precursor and a dry oxygen-comprising gaseous material while generating a plasma;

after depositing, blanket exposing the first layer to an oxygen comprising plasma effective to form the low dielectric constant insulative layer from the first layer and to reduce the first dielectric constant to a second dielectric constant that is the relatively low dielectric constant for the insulative layer.

103. The method of claim 102, wherein the dry oxygen-comprising gaseous material is selected from a group consisting of oxygen, ozone, nitrous oxide, NO_x and mixtures thereof.

104. The method of claim 102, where blanket exposing comprises employing the dry oxygen-comprising gaseous material to form the oxygen comprising plasma.

105. The method of claim 104, where the dry oxygen-comprising gaseous material is selected from a group consisting of oxygen, ozone, nitrous oxide, NO_x and mixtures thereof.

106. The method of claim 102, wherein the dry oxygen-comprising gaseous material is chosen from a group consisting of CO, CO_2, NO_2 or NO_X and the oxygen comprising plasma is formed employing a gas selected from a group consisting of oxygen or ozone.

107. The method of claim 102, wherein the gaseous material precursor is a methylsilane compound.

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108. The method of claim 102, wherein the gaseous material precursor is a methylsilane compound and the dry oxygen-comprising gaseous material is selected from a group consisting of oxygen, ozone, nitrous oxide, NO_x and mixtures thereof.

109. The method of claim 108, where the oxygen comprising plasma is formed employing another, different oxygen-comprising gaseous material selected from a group consisting of oxygen, ozone, nitrous oxide, NO_x and mixtures thereof.

110. The method of claim 102, where blanket exposing is effective to increase stability of the second dielectric constant to variation compared to stability of the first dielectric constant.

111. The method of claim 102, where blanket exposing occurs within the reaction chamber without removing the substrate from the reaction chamber between chemical vapor depositing and blanket exposing.

112. The method of claim 102, wherein a temperature of the substrate during blanket exposing is always less than or equal to 550°C.

113. The method of claim 102, where blanket exposing is ineffective to appreciably etch the first layer or the insulative layer.

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114. The method of claim 102, wherein the first layer subjected to blanket exposing comprises silicon atoms bonded to carbon atoms.

115. The method of claim 102, where at least some of the carbon atoms are present within a CH_3 group.

116. The method of claim 102, where the first layer comprises $(CH_3)_xSiO_y$ which remains substantially as $(CH_3)_xSiO_y$ after blanket exposing converts the first layer to the insulative layer.

117. The method of claim 102, where the first layer comprises $(CH_3)_xSiO_y$ which remains substantially as $(CH_3)_xSiO_y$ after blanket exposing converts the first layer to the insulative layer, and wherein blanket exposing comprises blanket exposing for at least 20 seconds.

118. The method of claim 102, where the first layer comprises silicon atoms bonded to carbon atoms, a whole of the first layer is not transformed from one base chemistry to another by blanket exposing converting the first layer to the insulative layer, and blanket exposing comprises blanket exposing for at least 20 seconds.

119. The method of claim 102, where the first layer comprises silicon atoms bonded to carbon atoms, a whole of the first layer is not transformed from one base chemistry to another by blanket exposing converting the first layer to the insulative layer, and blanket exposing comprises blanket exposing for at least 40 seconds.

120. The method of claim 102, where the first layer comprises silicon atoms bonded to carbon atoms, a whole of the first layer is not transformed from one base chemistry to another by blanket exposing converting the first layer to the insulative layer, and wherein blanket exposing comprises blanket exposing for between at least 20 seconds to at least 100 seconds.

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121. The method of claim 102, wherein the first layer comprises silicon atoms bonded to carbon atoms, wherein a whole of the first layer is not transformed from one base chemistry to another by the blanket exposing converting the first layer to the insulative layer, and wherein blanket exposing comprises blanket exposing for at least 100 seconds.

122. The method of claim 102 wherein the majority of the carbon atoms present in the first layer are in the form of methyl groups, and wherein the methyl groups comprise from 10% to about 50% (mole percent) of the first layer.

123. The method of claim 102 wherein the majority of the carbon atoms present in the insulative layer are in the form of methyl groups, and wherein the methyl groups comprise from 10% to about 50% (mole percent) of the insulative layer.

124. The method of claim 102, wherein the insulative layer is configured to act as an interlevel dielectric layer.

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125. The method of claim 102, wherein the first layer comprises silicon atoms bonded to both organic material and nitrogen.

126. The method of claim 102, wherein the second dielectric constant is about ten percent less than the first dielectric constant.

127. The method of claim 102, wherein the second dielectric constant is about fifteen percent less than the first dielectric constant.

128. The method of claim 102, wherein the second dielectric constant is in a range of about 2.5 to 2.0.

SuF3

129. A method for forming an insulative layer having a low dielectric constant comprising:

loading a substrate including at least partially formed integrated circuitry thereon into a reaction chamber for a chemical vapor deposition apparatus;

with the substrate in the reaction chamber, chemically vapor depositing a first layer, having a first dielectric constant, on the substrate and on the at least partially formed integrated circuitry by introducing into the reaction chamber a gaseous material precursor and a dry oxygen-comprising gaseous material while generating a plasma;

after depositing, blanket exposing the first layer to an oxygen comprising plasma effective to form the insulative layer from the first layer and to reduce the first dielectric constant to a second dielectric constant for the insulative layer, where the second dielectric constant is in a range of about 2.5 to 2.0 and the insulative layer comprises $(CH_3)_xSiO_y$.

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130. The method of claim 129 wherein the majority of the carbon atoms present in the insulative layer are in the form of methyl groups, and wherein the methyl groups comprise from 10% to about 50% (mole percent) of the insulative layer.

131. The method of claim 129, wherein the insulative layer is configured to act as an interlevel dielectric layer.

132. The method of claim 129, wherein the first layer comprises silicon atoms bonded to both organic material and nitrogen.

133. The method of claim 129, wherein the second dielectric constant is about ten percent less than the first dielectric constant..

E6 contd

134. The method of claim 129, wherein the second dielectric constant is about fifteen percent less than the first dielectric constant.